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TO : Acer

DATE : Oct. 13, 2009.

SAMSUNG TFT-LCD**MODEL NO. : LTN140AT01-G03**

NOTE : Extension code [-G]
→ LTN140AT01-G03
Surface type [**Glare**]

Any modification of Spec is not allowed without SEC's permissionAPPROVED BY : 

PREPARED BY :

Mia So**Application Engineer part 1, Device Solution (LCD)****SAMSUNG ELECTRONICS CO., LTD.****wise
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REVISION HISTORY

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| Date | Revision No. | Page | Summary |
|----------------|--------------|------------|---|
| June. 4, 2009 | P00 | All | The Preliminary specification of LTN140AT01-G03 was issued first. |
| June. 16, 2009 | A00 | All | The Approval specification of LTN140AT01-G03 was issued first. |
| June. 26, 2009 | A01 | All | Outline drawing was updated. |
| July. 10. 2009 | A02 | P23 ~25 | Packing was updated. Form material was changed and one sack quantity was changed to 30pcs Marking items are updated. |
| Sep.03.2009 | A03 | P12 | PWM Min value was removed. |
| Oct.13.2009 | A04 | P20 | Power Sequence was updated. |

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GENERAL DESCRIPTION

DESCRIPTION

LTN140AT01-G03 is a color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as switching devices. This model is composed of a TFT LCD panel, a driver circuit and a backlight system. The resolution of a 14.0" contains 1366 x 768 pixels and can display up to 262,144 colors. 6 O'clock direction is the Optimum viewing angle.

FEATURES

- High contrast ratio, high aperture structure
- 1366 x 768 pixels resolution
- Fast Response Time
- Low power consumption
- LED BLU Structure
- DE (Data enable) only mode.
- 3.3V LVDS Interface
- On board EDID chip
- RoHS Compliance

APPLICATIONS

- Notebook PC
- If the usage of this product is not for PC application, but for others, please contact SEC

GENERAL INFORMATION

| Item | Specification | Unit | Note |
|-------------------|---|-------|--------|
| Display area | 309.399(H) X 173.952(V) (14.0"diagonal) | mm | |
| Driver element | a-si TFT active matrix | | |
| Display colors | 262,144 | | |
| Number of pixel | 1366 x 768 | pixel | 16 : 9 |
| Pixel arrangement | RGB vertical stripe | | |
| Pixel pitch | 0.2265(H) x 0.2265(V) | mm | |
| Display Mode | Normally white | | |
| Glass Thickness | 0.5T | | |
| Surface treatment | Haze 0, Hard-Coating 3H | | |

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Mechanical Information

| Item | | Min. | Typ. | Max. | Unit | Note |
|-------------|----------------|-------|-------|-------|------|------|
| Module size | Horizontal (H) | 323.0 | 323.5 | 324.0 | mm | |
| | Vertical (V) | 191.5 | 192.0 | 192.5 | mm | |
| | Depth (D) | - | 4.9 | 5.2 | mm | (1) |
| Weight | | - | 345 | 360 | g | |

Note (1) Measurement condition of outline dimension

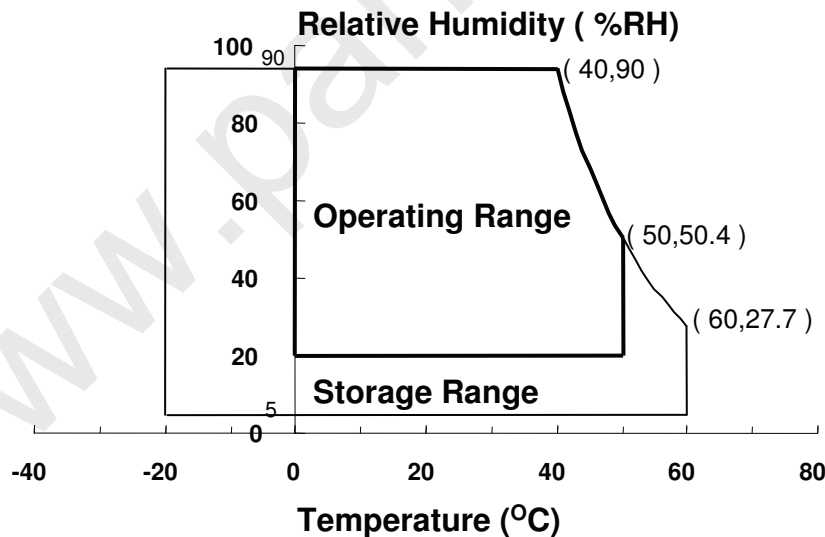
- Equipment : Vernier Calipers
- Push Force : 500g · f (minimum)

1. ABSOLUTE MAXIMUM RATINGS

1.1 ENVIRONMENTAL ABSOLUTE RATINGS

| Item | Symbol | Min. | Max. | Unit | Note |
|---|--------|------|------|------|---------|
| Storage temperate | TSTG | -20 | 60 | °C | (1) |
| Operating temperate (Temperature of glass surface) | TOPR | 0 | 50 | °C | (1) |
| Shock (non-operating) | Snop | - | 240 | G | (2),(4) |
| Vibration (non-operating) | Vnop | - | 2.41 | G | (3),(4) |

Note (1) Temperature and relative humidity range are shown in the figure below.

95 % RH Max. ($40^{\circ}\text{C} \geq T_a$)Maximum wet - bulb temperature at 39°C or less. ($T_a > 40^{\circ}\text{C}$) No condensation(2) 2ms, half sine wave, one time for $\pm X, \pm Y, \pm Z$.

(3) 5 - 500 Hz, random vibration, 30min for X, Y, Z.

(4) At testing Vibration and Shock, the fixture in holding the Module to be tested have to be hard and rigid enough so that the Module would not be twisted or bent by the fixture.

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1.2 ELECTRICAL ABSOLUTE RATINGS

(1) TFT LCD MODULE

 $V_{DD} = 3.3V$, $V_{SS} = GND = 0V$

| Item | Symbol | Min. | Max. | Unit | Note |
|----------------------|----------|----------------|----------------|------|------|
| Power Supply Voltage | V_{DD} | $V_{DD} - 0.3$ | $V_{DD} + 0.3$ | V | (1) |
| Logic Input Voltage | V_{DD} | $V_{DD} - 0.3$ | $V_{DD} + 0.3$ | V | (1) |

Note (1) Within T_a ($25 \pm 2^\circ C$)

(2) BACK-LIGHT UNIT

 $T_a = 25 \pm 2^\circ C$

| Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|-------------|--------|------|------|------|------|------|
| LED Current | I_L | - | 20 | - | mA | (1) |
| LED Voltage | F_L | - | 3.2 | - | V | (1) |

Note 1) Permanent damage to the device may occur if maximum values are exceeded

Functional operation should be restricted to the conditions described under normal operating conditions.

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2. OPTICAL CHARACTERISTICS

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods shown in Note (5).
Measuring equipment : TOPCON BM-5A and PR-650

* Ta = 25 ± 2 °C, VDD=3.3V, fv= 60Hz, fDCLK = 72.33MHz, IL = 20 mA

| Item | | Symbol | Condition | Min. | Typ. | Max | Unit | Note |
|---|-------|--------------------|--|-------|-------|-------|-------------------|--------------------|
| Contrast Ratio (5 Points) | | CR | Normal Viewing Angle $\phi = 0$ $\theta = 0$ | 400 | 500 | - | - | (1), (2), (5) |
| Response Time at Ta (Rising + Falling) | | T _{RT} | | - | 8 | 12 | msec | (1), (3) |
| Average Luminance of White (5 Points) | | Y _{L,AVE} | | 190 | 220 | - | cd/m ² | (1), (4) |
| Color Chromaticity (CIE) | Red | R _X | | 0.540 | 0.570 | 0.600 | - | (1), (5) PR-650 |
| | | R _Y | | 0.305 | 0.335 | 0.365 | | |
| | Green | G _X | | 0.310 | 0.340 | 0.370 | | |
| | | G _Y | | 0.520 | 0.550 | 0.580 | | |
| | Blue | B _X | | 0.120 | 0.150 | 0.180 | | |
| | | B _Y | | 0.070 | 0.100 | 0.130 | | |
| | White | W _X | | 0.283 | 0.313 | 0.343 | | |
| | | W _Y | | 0.299 | 0.329 | 0.359 | | |
| Viewing Angle | Hor. | θ_L | CR ≥ 10 | 40 | 45 | - | Degrees | (1), (5) BM-5A |
| | | θ_H | | 40 | 45 | - | | |
| | Ver. | ϕ_H | | 10 | 15 | - | | |
| | | ϕ_L | | 25 | 35 | - | | |
| Color Gamut | | CG | | 42 | 45 | - | % | |
| 13 Points White Variation | | δ_L | | - | - | 1.7 | - | (6) |

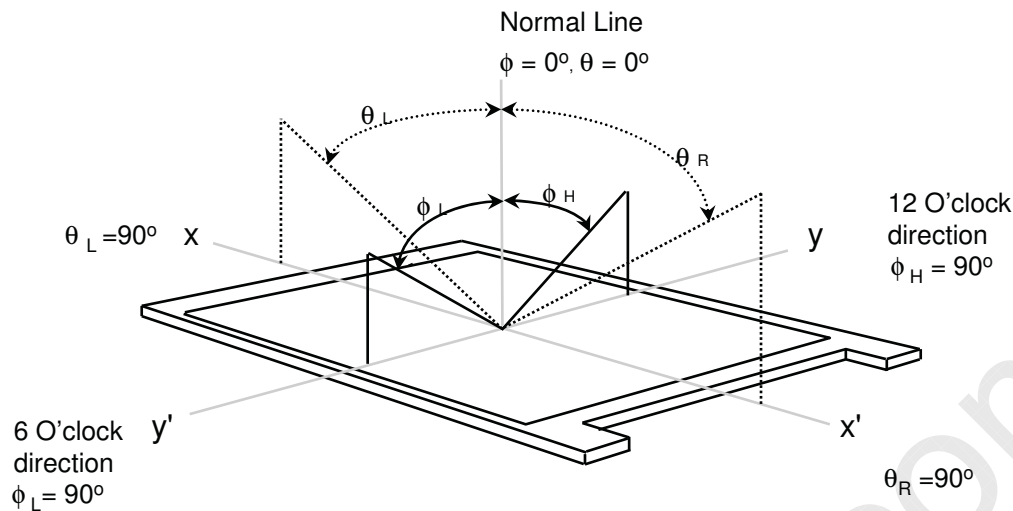
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Note 1) Definition of Viewing Angle : Viewing angle range($10 \leq C/R$)

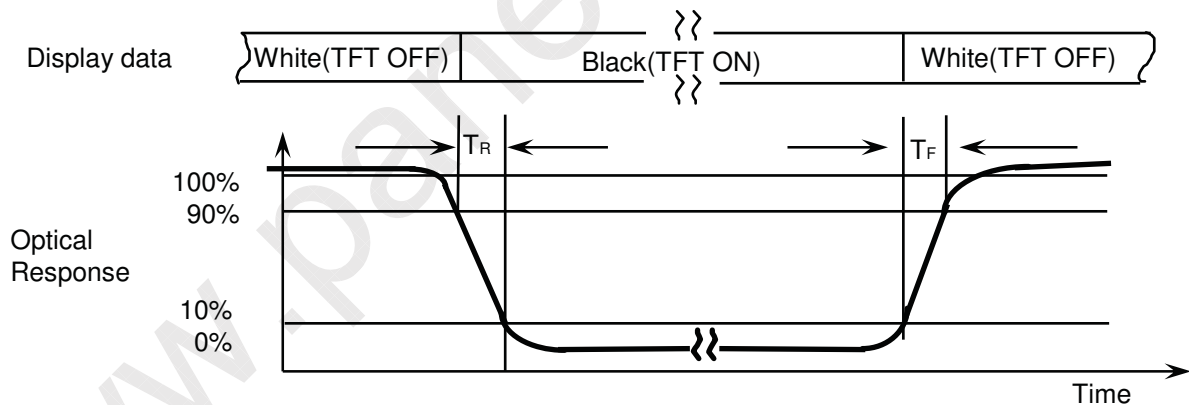


Note 2) Definition of Contrast Ratio (CR) : Ratio of gray max (Gmax) ,gray min (Gmin) at 5 points(4, 5, 7, 9, 10)

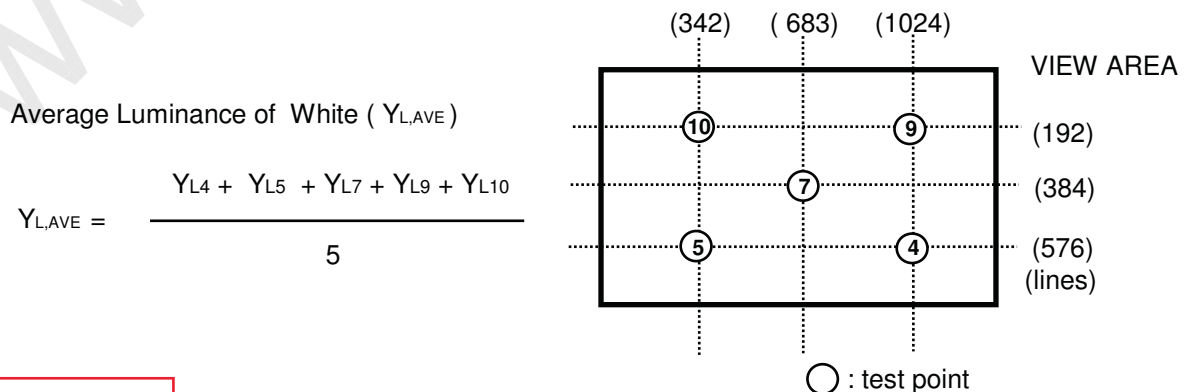
$$CR = \frac{CR(4) + CR(5) + CR(7) + CR(9) + CR(10)}{5}$$

Points : (4) , (5) , (7) , (9) , (10) at the figure of Note (6).

Note 3) Definition of Response time :



Note 4) Definition of Average Luminance of White : measure the luminance of white at 5 points.



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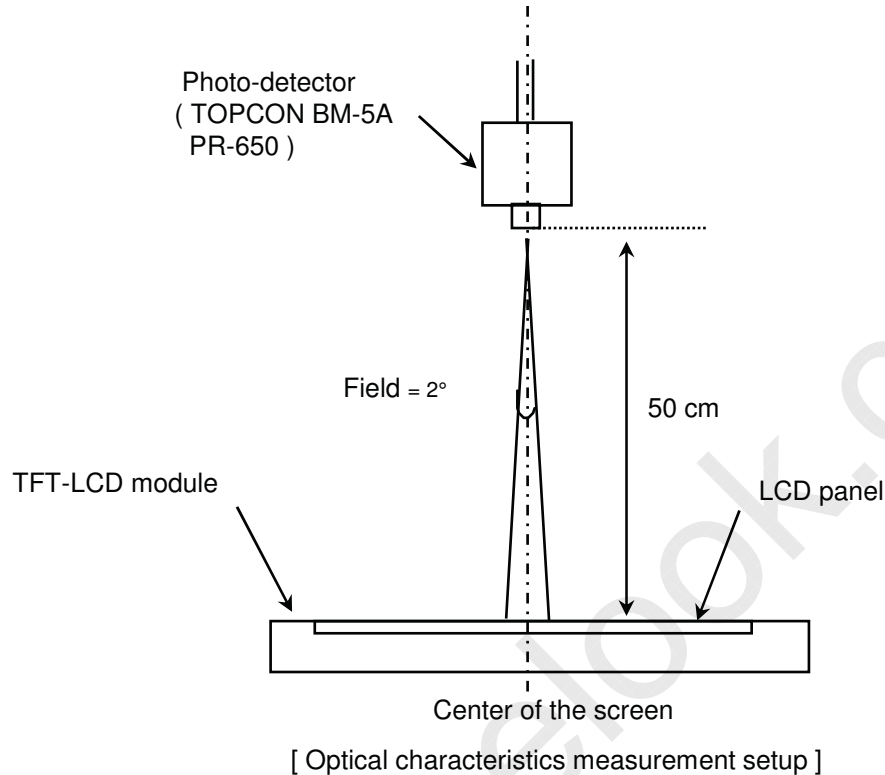
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Note 5) After stabilizing and leaving the panel alone at a given temperature for 30 min , the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. 30 min after lighting the backlight. This should be measured in the center of screen.

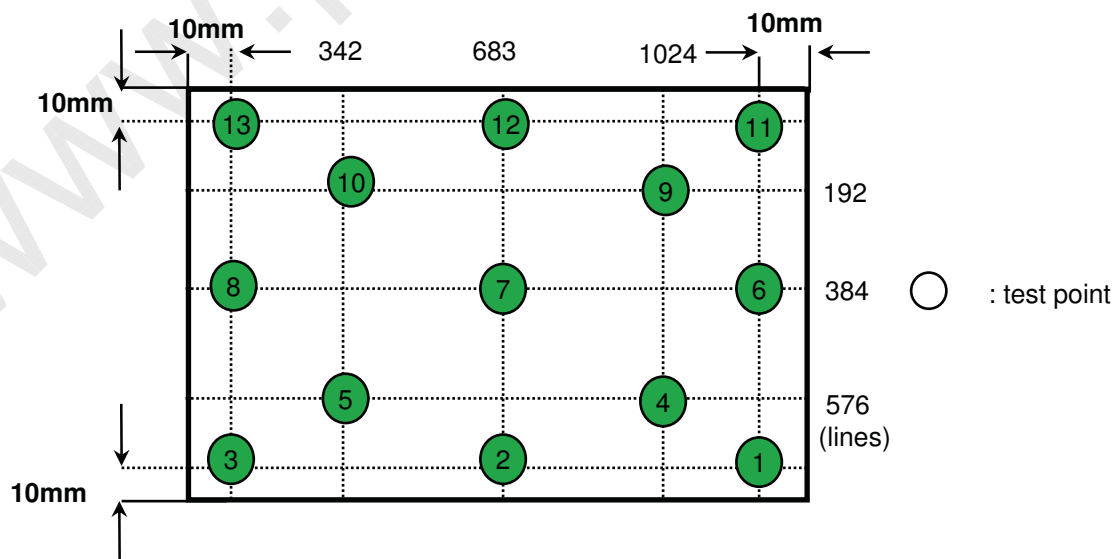
LED current : 20.0mA

Environment condition : $T_a = 25 \pm 2 \text{ }^{\circ}\text{C}$



Note 6) Definition of 13 points white variation (δL), [① ~ ⑬]

$$\delta L = \frac{\text{Maximum luminance of 13 points}}{\text{Minimum luminance of 13 points}}$$

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3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

Ta= 25 ± 2°C

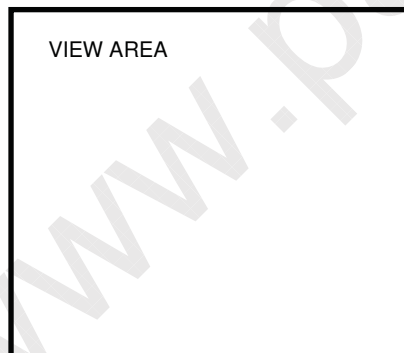
| Item | | Symbol | Min. | Typ. | Max. | Unit | Note |
|--|-----------|-------------------|-------|-------|-------|------|-------------------------|
| Voltage of Power Supply | | V _{DD} | 3.0 | 3.3 | 3.6 | V | |
| Differential Input Voltage for LVDS Receiver Threshold | High | V _{IH} | - | - | +100 | mV | V _{CM} = +1.2V |
| | Low | V _{IL} | -100 | - | - | mV | |
| Vsync Frequency | | f _v | 50 | 60 | - | Hz | |
| Hsync Frequency | | f _H | - | 47.4 | - | KHz | Vsync=60Hz |
| Main Frequency | | f _{DCLK} | 60.28 | 72.33 | 84.39 | MHz | |
| Rush Current | | I _{RUSH} | - | - | 1.5 | A | (4) |
| Current of Power Supply | White | I _{DD} | - | 300 | - | mA | (2),(3)*a |
| | Mosaic | | - | 350 | - | mA | (2),(3)*b |
| | V. Stripe | | - | 450 | 485 | mA | (2),(3)*c |

Note (1) Display data pins and timing signal pins should be connected.(GND = 0V)

(2) f_v = 60Hz, f_{DCLK} = 72.33MHZ, V_{DD} = 3.3V , DC Current.

(3) Power dissipation pattern

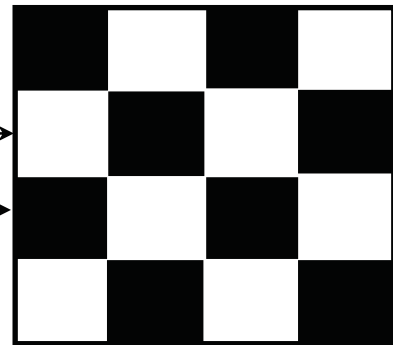
*a) White Pattern



*b) Mosaic Pattern

Display Brightest Gray Level →

Display Darkest Gray Level →

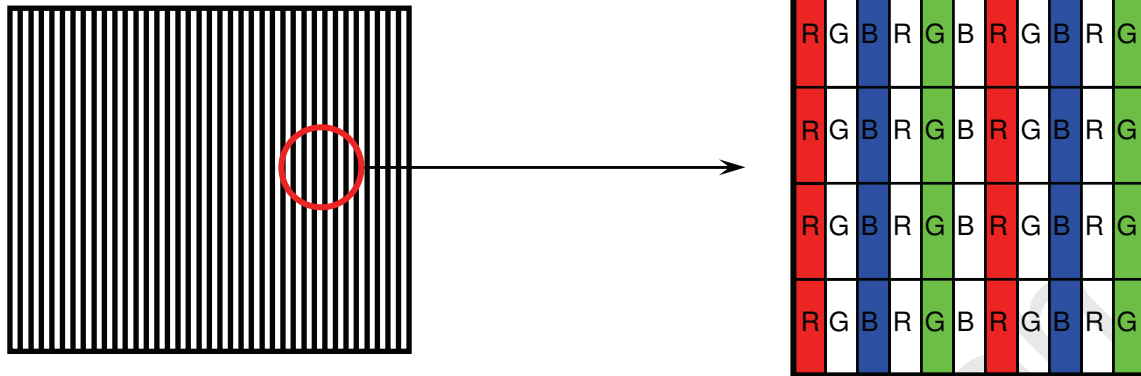


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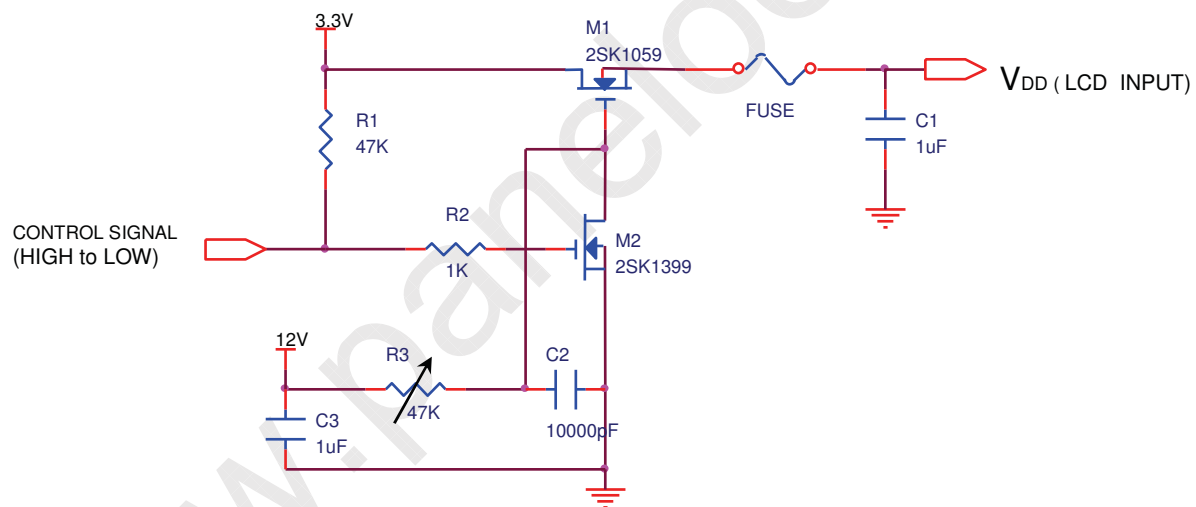
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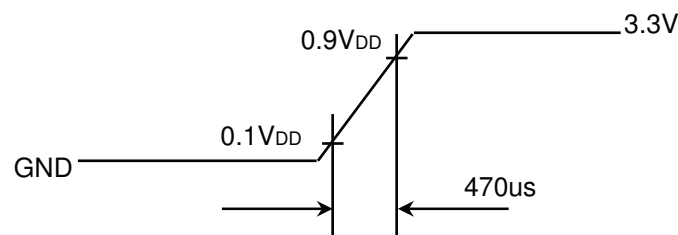
*c) 1dot Vertical stripe pattern



4) Rush current measurement condition



V_{DD} rising time is 470us



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3.2 BACK-LIGHT UNIT

Ta= 25 ± 2 °C

| Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|---------------------|--------|------|------|------|------|-------------------|
| LED Forward Current | IF | - | 20.0 | - | mA | |
| LED Forward Voltage | VF | - | 3.2 | - | V | |
| LED Array Voltage | VP | - | 22.4 | - | V | Vf X 7 LEDs |
| Power Consumption | P | - | 3.2 | - | W | If X Vf X 42 LEDs |

3.3 LED Driver

- LED Driver Manufacturer : Ricktek

Ta= 25 ± 2 °C

| Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|-------------------|------|------|------|------|--|
| Input Voltage | V _{in} | 7 | 12 | 20 | V | |
| Input Current | I | - | 230 | - | mA | |
| Input Power | P _{in} | - | 2.8 | - | W | |
| Operating Frequency | F _o | 675 | 750 | 825 | KHz | - |
| Burst Ratio | D | 10 | - | 100 | % | |
| External PWM Dimming Control Frequency (BLIM) | F _{BLIM} | - | 1 | 20 | kHz | V _{in} =8~21V, BLIM=PWM 0V~3.3V |
| Efficiency | η | 80 | - | - | % | BLIM=100% |

Note (1) Test Equipment : Fluke 45

(2) SEC guarantee PWM frequency from 0.2kHz to 10KHz

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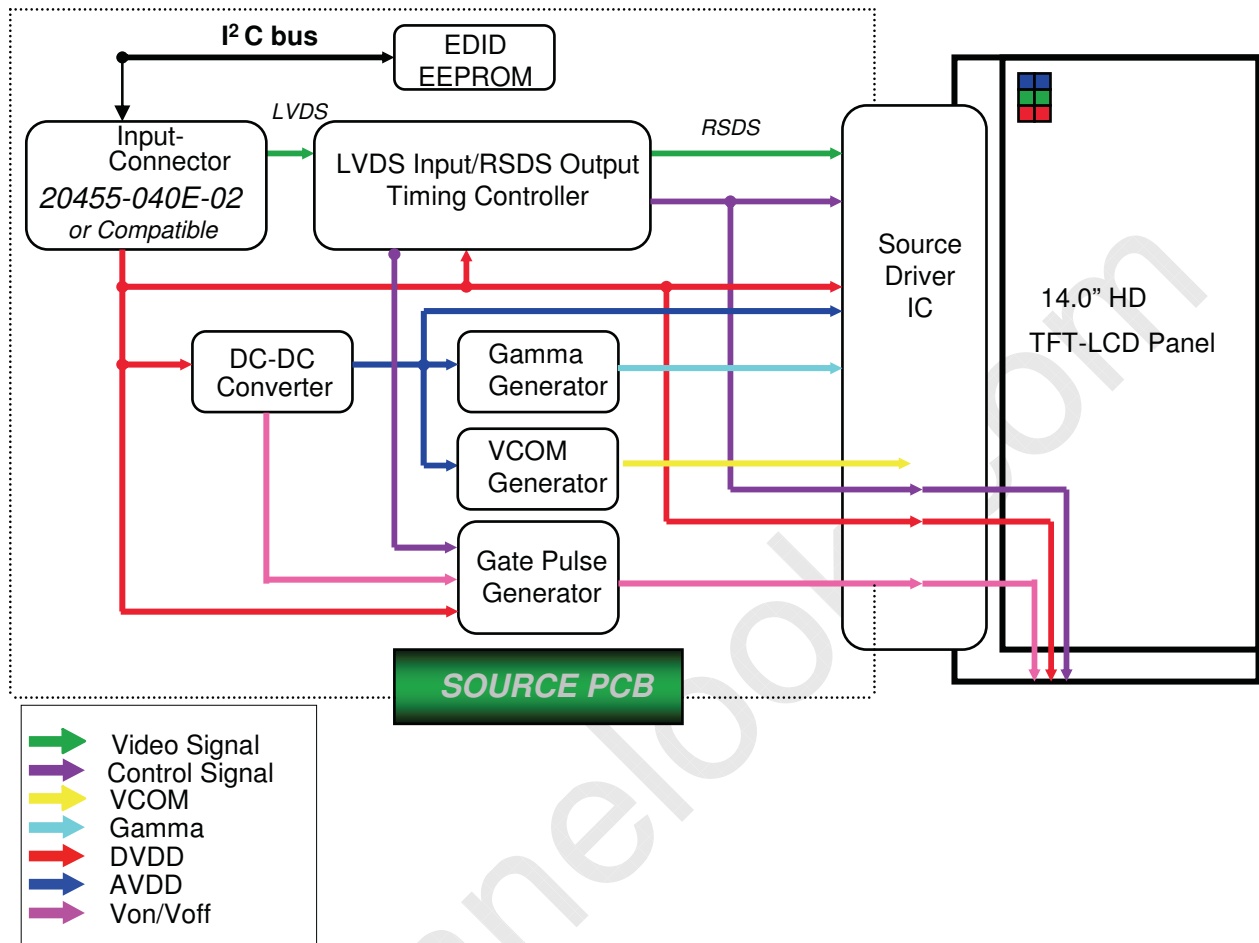
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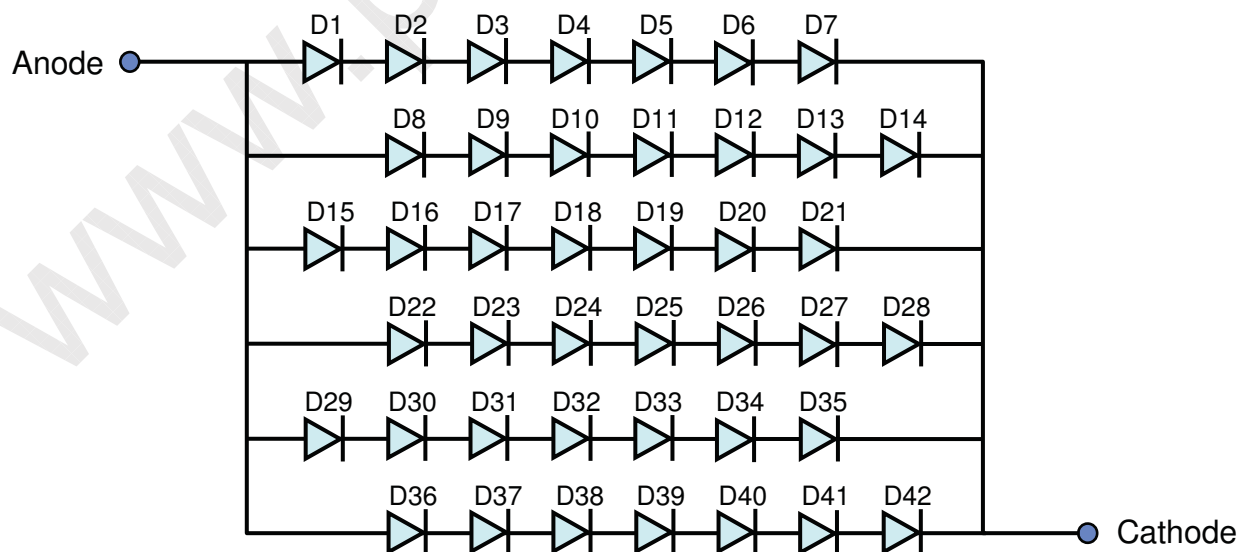
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4. BLOCK DIAGRAM

4.1 TFT LCD Module



4.2 LED placement structure



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5. INPUT TERMINAL PIN ASSIGNMENT

5.1. Input Signal & Power (LVDS, Connector : I-PEX 20455-040 or equivalent)

| Pin | Symbol | Function |
|---------|----------|--|
| 1 | NC | no connect |
| 2~3 | VDD | Logic power 3.3V (Panel logic, BL logic) |
| 4 | VEDID | EDID 3.3V power |
| 5 | NC | no connect |
| 6 | CLK | EDID clock |
| 7 | DATA | EDID data |
| 8 | RIN0- | - LVDS differential data input (R0-R5, G0) |
| 9 | RIN0+ | + LVDS differential data input (R0-R5, G0) |
| 10 | GND | Ground |
| 11 | RIN1- | - LVDS differential data input (G1-G5, B0-B1) |
| 12 | RIN1+ | + LVDS differential data input (G1-G5, B0-B1) |
| 13 | GND | Ground |
| 14 | RIN2- | - LVDS differential data input (B2-B5,HS,VS, DE) |
| 15 | RIN2+ | + LVDS differential data input (B2-B5,HS,VS, DE) |
| 16 | GND | Ground |
| 17 | CLK- | - LVDS differential clock input |
| 18 | CLK+ | + LVDS differential clock input |
| 19 | GND | Ground |
| 20 ~ 21 | NC | no connect |
| 22 | GND | Ground |
| 23 ~ 24 | NC | no connect |
| 25 | GND | Ground |
| 26 ~ 27 | NC | no connect |
| 28 | GND | Ground |
| 29 ~ 30 | NC | no connect |
| 31 ~ 33 | VLED_GND | LED Ground |
| 34 | NC | no connect |
| 35 | S_PWMIN | System PWM Signal Input |
| 36 | BL_ON | LED enable pin (+3V input, +5V tolerance) |
| 37 | NC | no connect |
| 38~40 | VLED | LED Power Supply 7V-20V |

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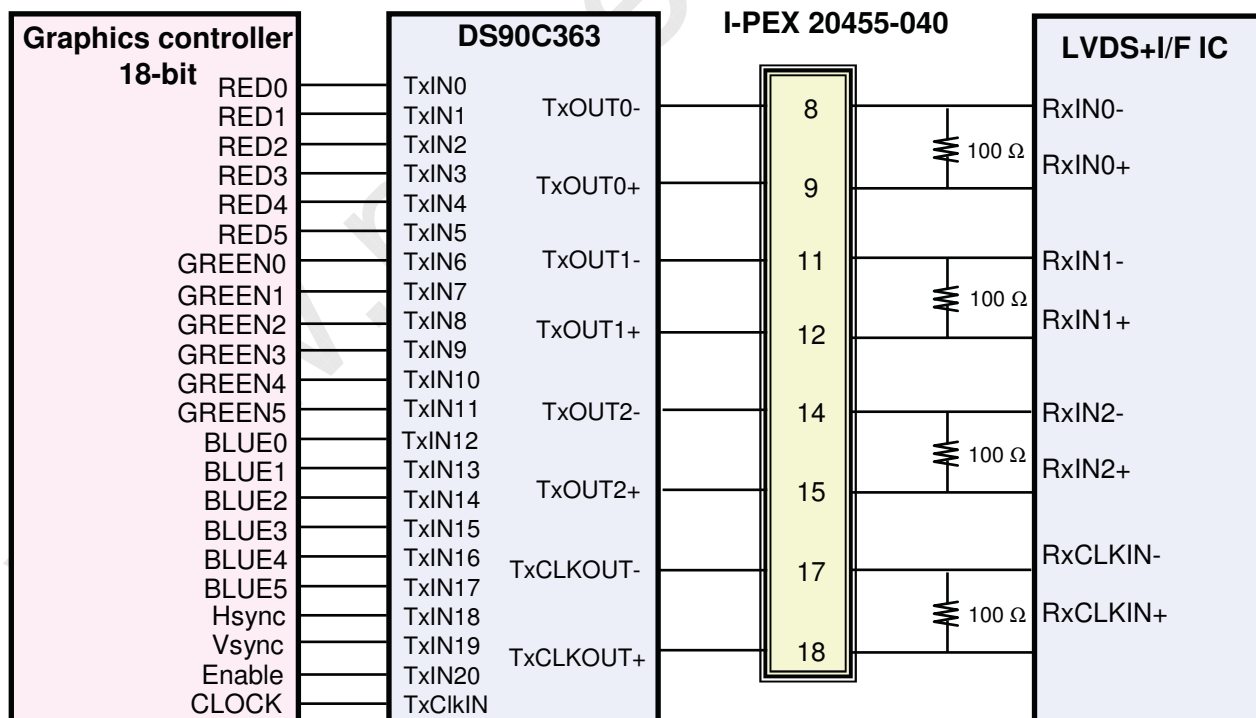
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5.2 LVDS Interface : Transmitter DS90C363 or Compatible

| Pin No. | Name | RGB Signal | Pin No. | Name | RGB Signal |
|---------|--------|------------|---------|---------|------------|
| 44 | TxIN0 | R0 | 12 | TxIN11 | G5 |
| 45 | TxIN1 | R1 | 13 | TxIN12 | B0 |
| 47 | TxIN2 | R2 | 15 | TxIN13 | B1 |
| 48 | TxIN3 | R3 | 16 | TxIN14 | B2 |
| 1 | TxIN4 | R4 | 18 | TxIN15 | B3 |
| 3 | TxIN5 | R5 | 19 | TxIN16 | B4 |
| 4 | TxIN6 | G0 | 20 | TxIN17 | B5 |
| 6 | TxIN7 | G1 | 22 | TxIN18 | Hsync |
| 7 | TxIN8 | G2 | 23 | TxIN19 | Vsync |
| 9 | TxIN9 | G3 | 25 | TxIN20 | DE |
| 10 | TxIN10 | G4 | 26 | TxCLKIN | Clock |

LVDS INTERFACE

Note : The LCD Module uses a 100ohm resistor between positive and negative lines of each receiver input.

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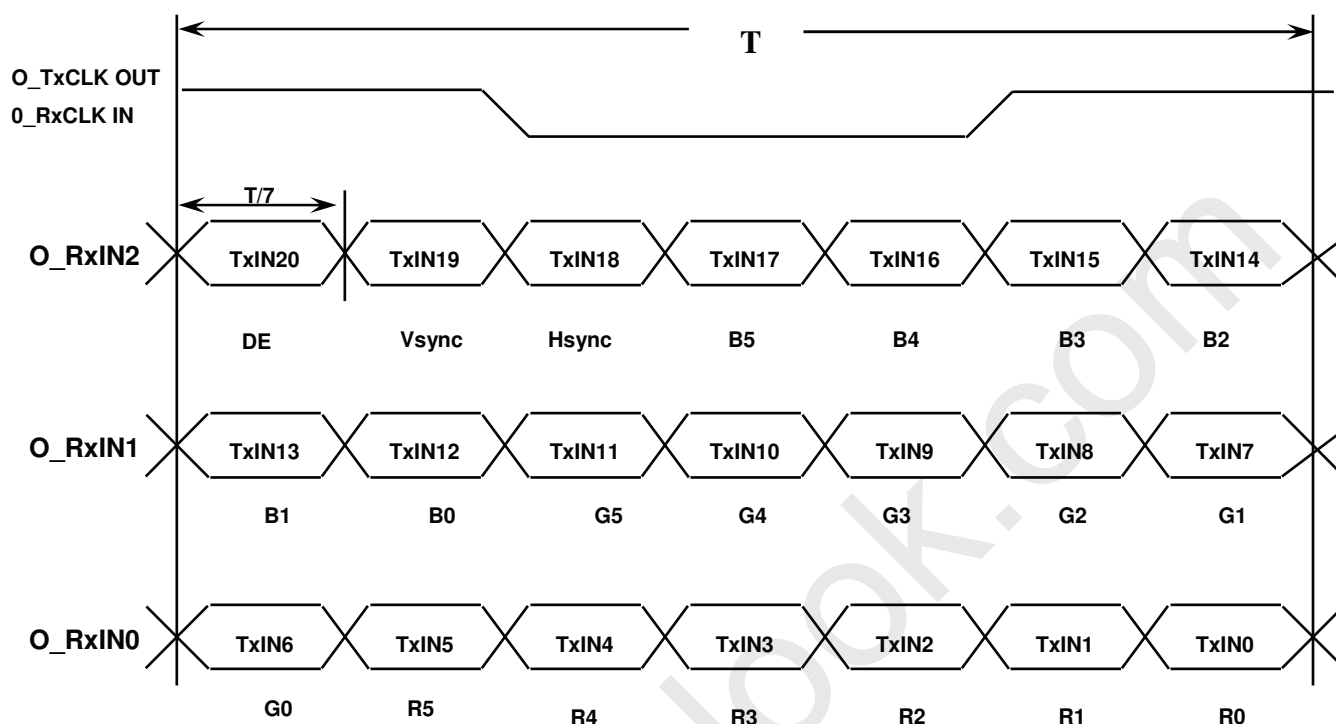
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5.3 Timing Diagrams of LVDS For Transmission

LVDS Receiver : Integrated T-CON



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5.4 Input Signals, Basic Display Colors and Gray Scale of Each Color

| Color | Display | Data Signal | | | | | | | | | | | | | | | | | Gray Scale Level | |
|---------------------|---------|-------------|----|----|----|----|----|-------|----|----|----|----|----|------|----|----|----|----|------------------|--------|
| | | Red | | | | | | Green | | | | | | Blue | | | | | | |
| | | R0 | R1 | R2 | R3 | R4 | R5 | G0 | G1 | G2 | G3 | G4 | G5 | B0 | B1 | B2 | B3 | 45 | | B5 |
| Basic Colors | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| | Blue | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | - |
| | Green | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| | Cyan | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | - |
| | Red | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| | Magenta | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | - |
| | Yellow | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| | White | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | - |
| Gray Scale Of Red | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R0 |
| | Dark | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R1 |
| | ↑ | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R2 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | R3~R60 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | |
| | ↓ | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R61 |
| | Light | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R62 |
| | Red | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R63 |
| Gray Scale Of Green | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | G0 |
| | Dark | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | G1 |
| | ↑ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | G2 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | G3~G60 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | |
| | ↓ | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | G61 |
| | Light | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | G62 |
| | Green | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | G63 |
| Gray Scale Of Blue | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | B0 |
| | Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | B1 |
| | ↑ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | B2 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | B3~B60 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | |
| | ↓ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | B61 |
| | Light | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | B62 |
| | Blue | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | B63 |

Note 1) Definition of gray :

Rn: Red gray, Gn: Green gray, Bn: Blue gray (n=gray level)

Note 2) Input signal: 0 =Low level voltage, 1=High level voltage

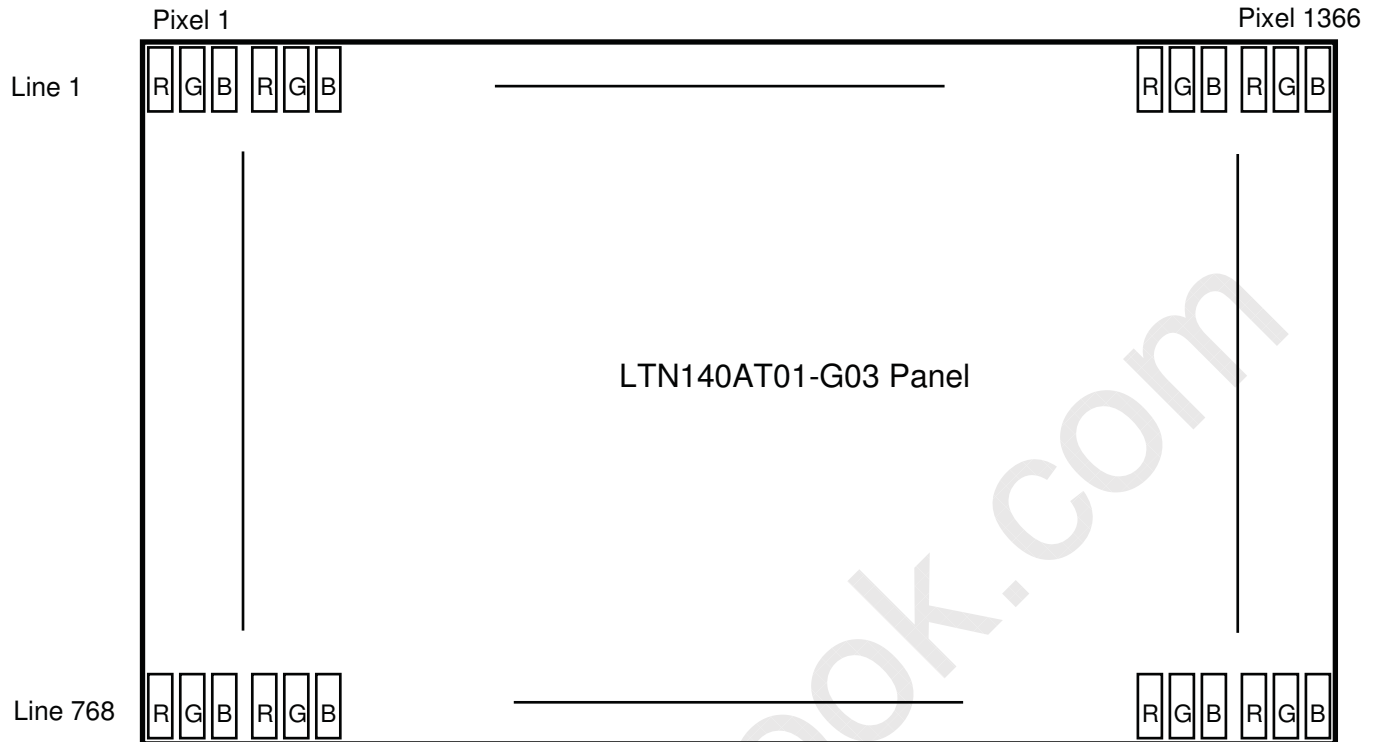
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5.5 Pixel Format in the display

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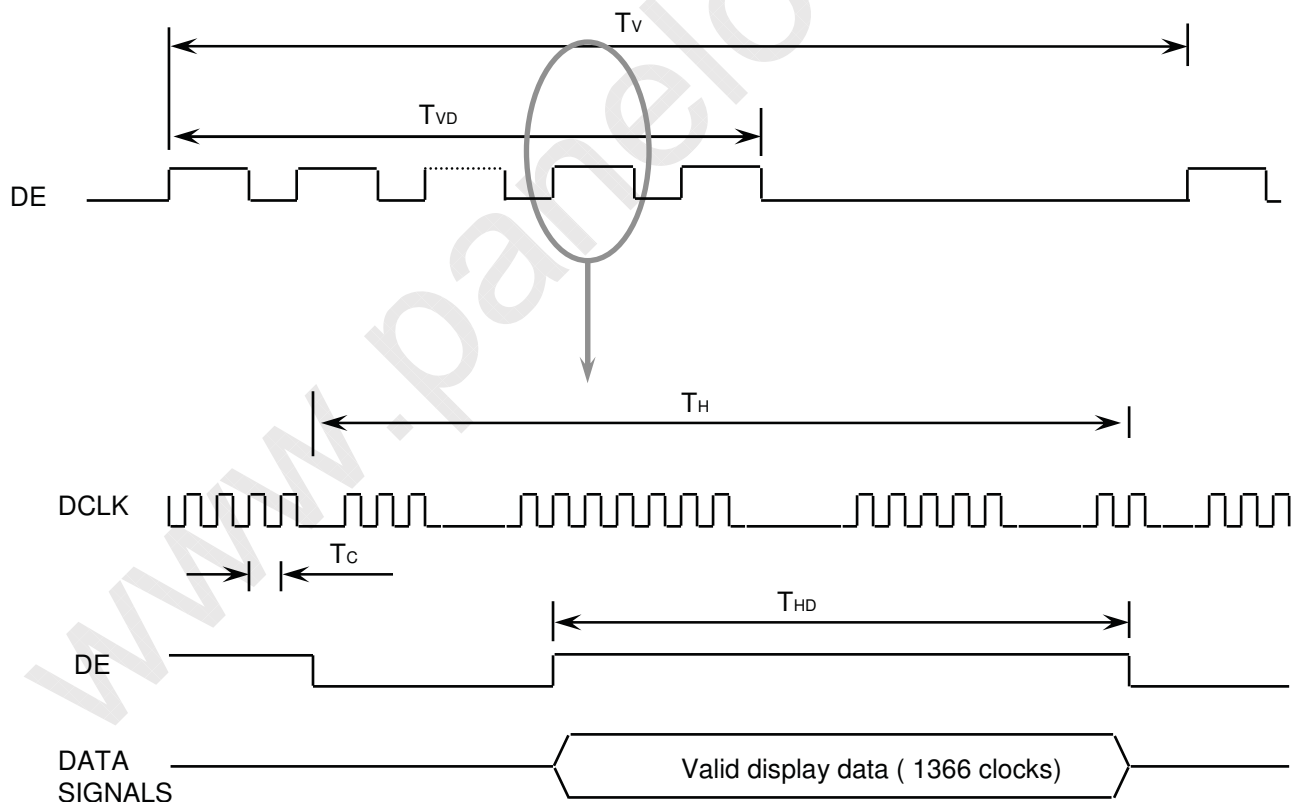
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6. INTERFACE TIMING

6.1 Timing Parameters

| Signal | Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|--------------------------------|----------------|--------|------|------|------|--------|------|
| Frame Frequency | Cycle | TV | 780 | 790 | 980 | Lines | - |
| Vertical Active Display Term | Display Period | TVD | - | 768 | - | Lines | - |
| One Line Scanning Time | Cycle | TH | 1440 | 1526 | 1800 | Clocks | - |
| Horizontal Active Display Term | Display Period | THD | - | 1366 | - | Clocks | - |

6.2 Timing diagrams of interface signal



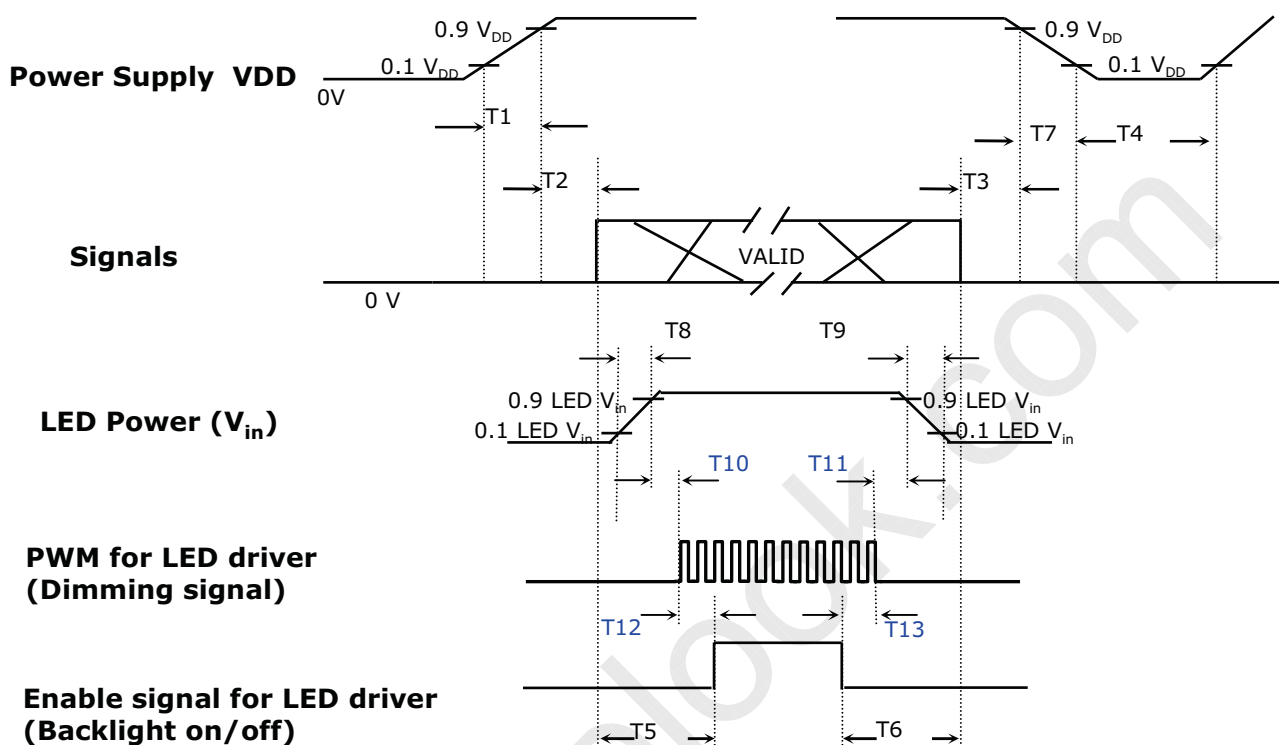
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6.3 Power ON/OFF Sequence

: To prevent a latch-up or DC operation of the LCD module, the power on/off sequence should be as the diagram below.



Power ON/OFF Sequence

| Timing (ms) | Remarks |
|--------------------|---|
| $0.5 < T1 \leq 10$ | V _{DD} rising time from 10% to 90% |
| $0 < T2 \leq 50$ | Delay from V _{DD} to valid data at power ON |
| $0 < T3 \leq 50$ | Delay from valid data OFF to V _{DD} OFF at power Off |
| $500 \leq T4$ | V _{DD} OFF time for Windows restart |
| $200 \leq T5$ | Delay from valid data to B/L enable at power ON |
| $200 \leq T6$ | Delay from valid data off to B/L disable at power Off |
| $0 < T7 \leq 10$ | V _{DD} falling time from 90% to 10% |
| $0.5 < T8 \leq 10$ | LED V _{in} rising time from 10% to 90% |
| $0.5 < T9 \leq 10$ | LED V _{in} falling time from 90% to 10% |
| $0 \leq T10$ | Delay from LED driver Vin rising time 90% to PWM ON |
| $0 \leq T11$ | Delay from PWM Off to LED driver Vin falling time 10%, Must Keep rule |
| $0 \leq T12$ | Delay from PWM ON to B/L Enable ON, Must Keep rule |
| $0 \leq T13$ | Delay from B/L Enable Off to PWM Off |

Power Sequence & Timing Parameters

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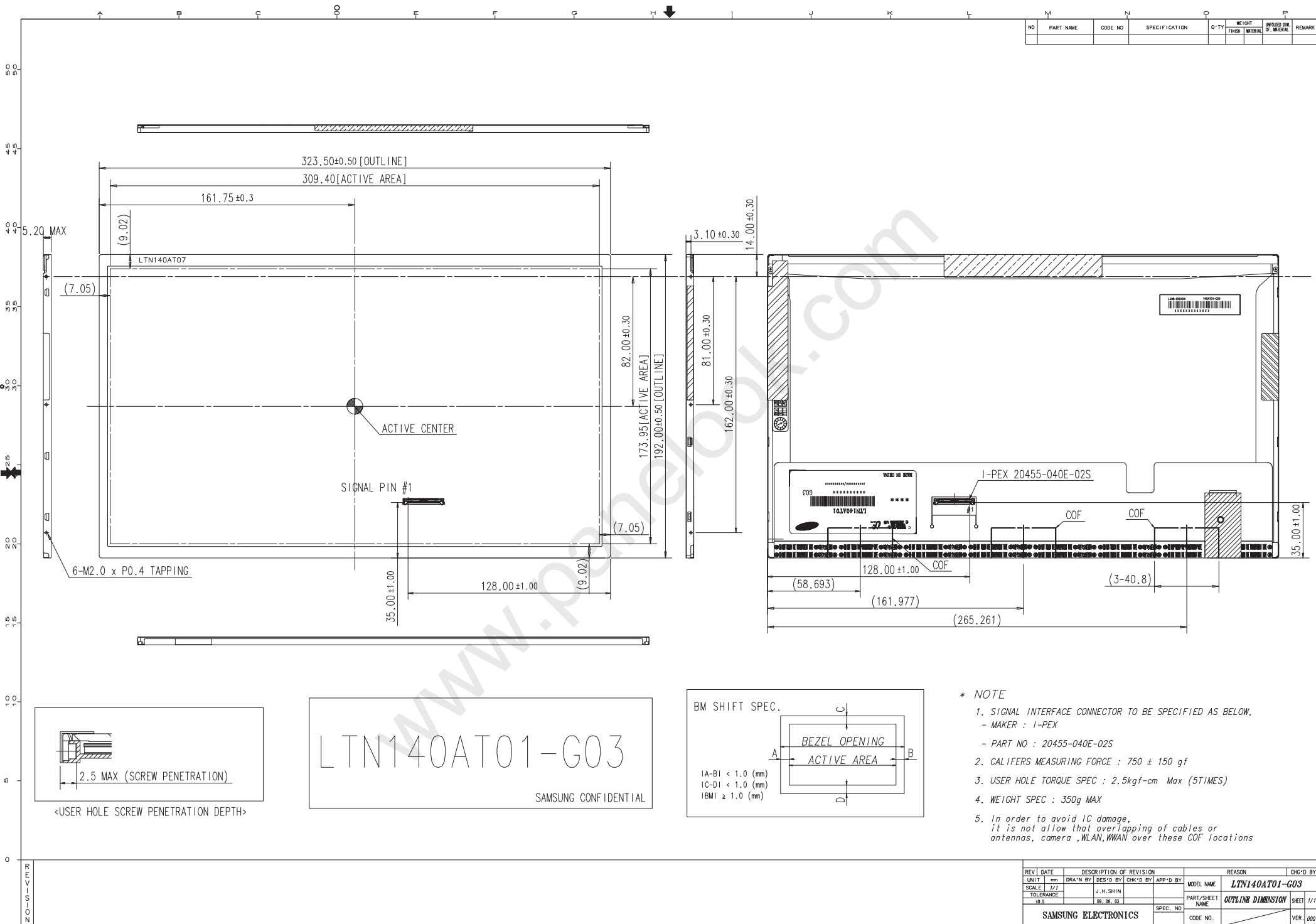
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7. MECHANICAL OUTLINE DIMENSION

[Refer to the next page]

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| | | | | | |
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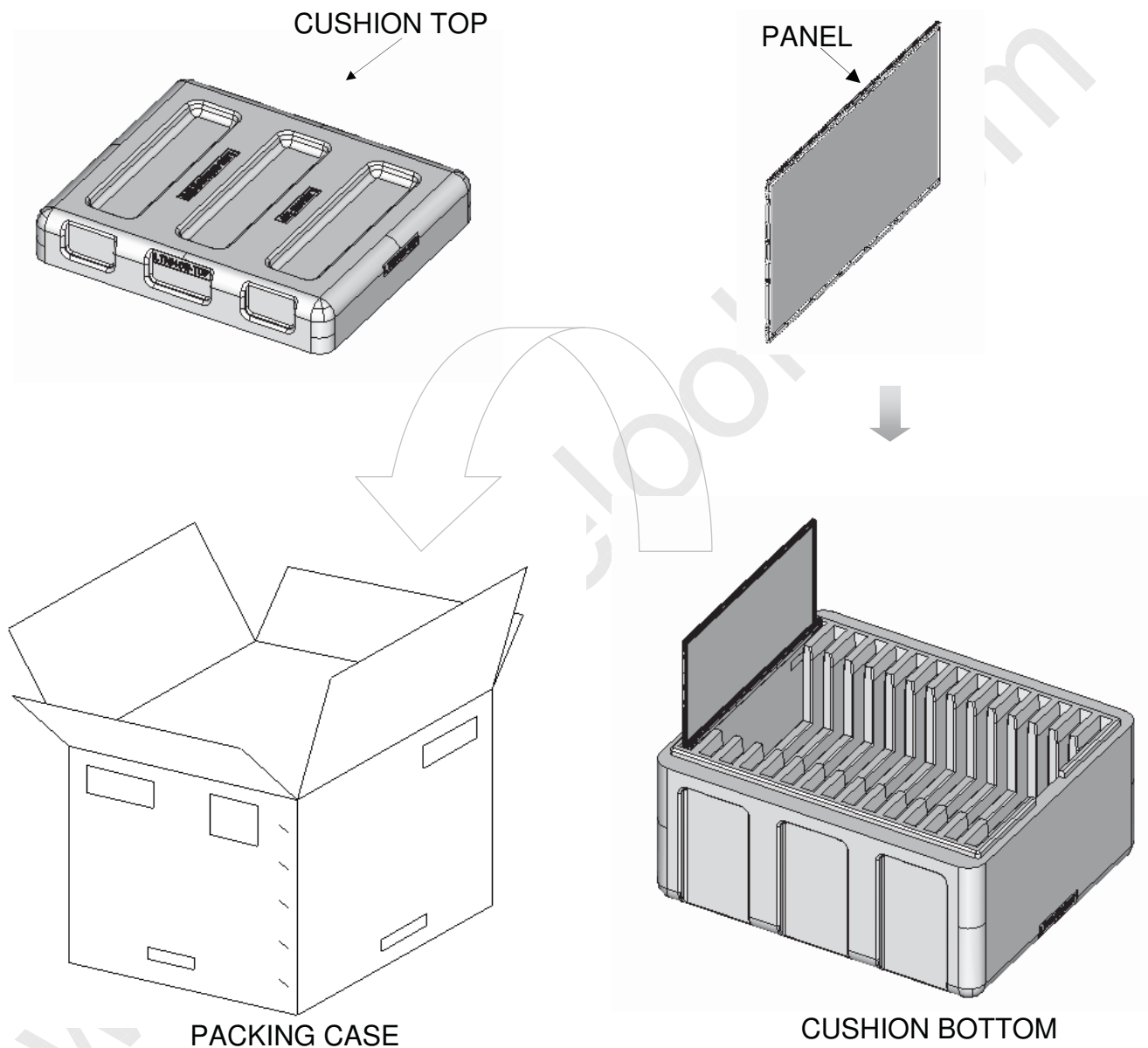
8. PACKING

1. CARTON(Internal Package)

(1) Packing Form

Corrugated Cardboard box and EPS form as shock absorber

(2) Packing Method



Note 1) Total Weight : Approximately (13.2) kg

2) Acceptance number of piling : 30 sets

3) Carton size : 495(W) x 423(D) x 310 (H)

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(3)Packing Material

| No | Part name | Quantity |
|----|---|----------|
| 1 | Static electric protective sack | 30 pcs |
| 2 | Packing case (Inner box) included shock absorber | 1 set |
| 3 | Pictorial marking | 2 pcs |
| 4 | Carton | 1 set |

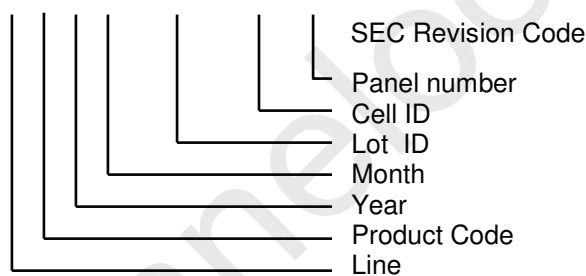
9. MARKINGS & OTHERS

A nameplate bearing followed by is affixed to a shipped product at the specified location on each product.

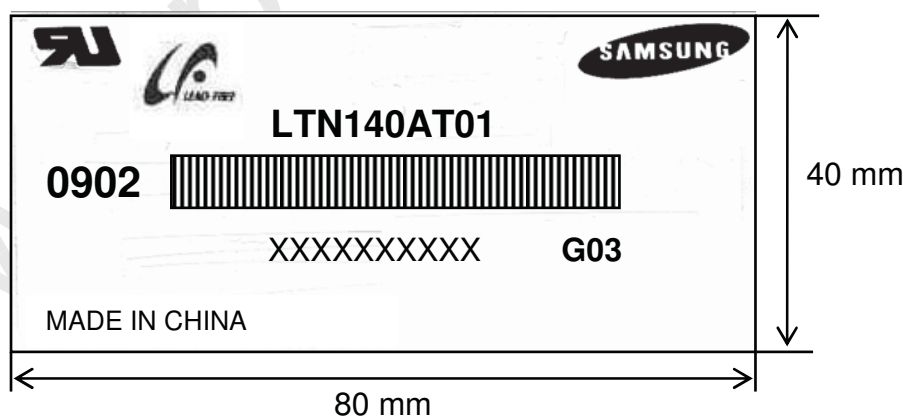
(1)Parts number : LTN140AT01

(2)Revision code : 3 letters

(3)Lot number : X X X X XXX XX X **G03**



(5) Nameplate Indication



Parts name : LTN140AT01
 Lot number : XXXXXXXXXX
 Inspected work week : 0902(2009 year, 2nd week)

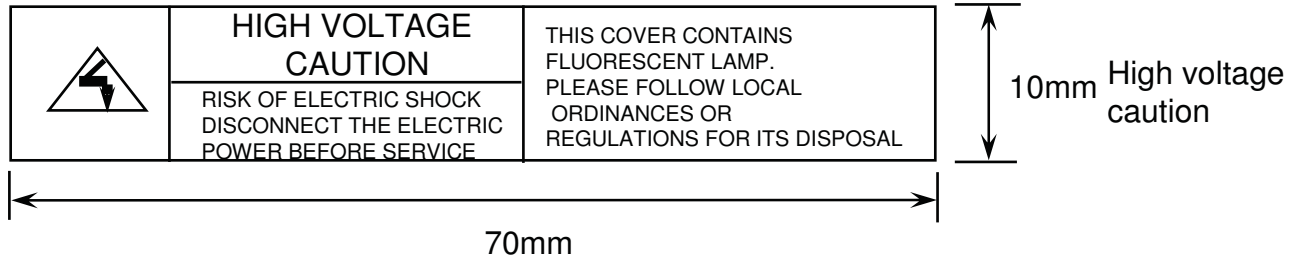
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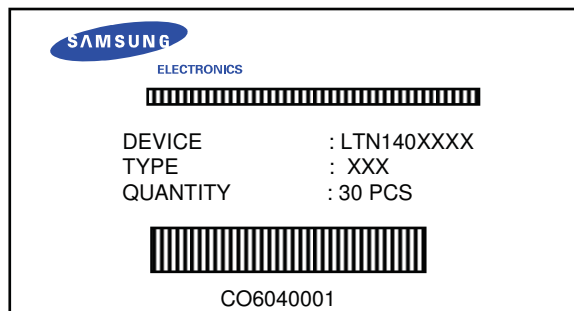
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(5) High voltage caution label



(6) Packing small box attach



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10. GENERAL PRECAUTIONS

1. Handling

- (a) When the module is assembled, It should be attached to the system firmly using every mounting holes. Be careful not to twist and bend the modules.
- (b) Refrain from strong mechanical shock and / or any force to the module. In addition to damage, this may cause improper operation or damage to the module and CCFT back-light.
- (c) Note that polarizers are very fragile and could be easily damaged. Do not press or scratch the surface harder than a HB pencil lead.
- (d) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, Staining and discoloration may occur.
- (e) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.
- (f) The desirable cleaners are water, IPA (Isoprophyl Alcohol) or Hexane.
Do not use Ketone type materials(ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.
- (g) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth . In case of contact with hands, legs or clothes, it must be washed away thoroughly with soap.
- (h) Protect the module from static , it may cause damage to the C-MOS Gate Array IC.
- (i) Use fingerstalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
- (j) Do not disassemble the module.
- (k) Do not pull or fold the lamp wire.
- (l) Do not adjust the variable resistor which is located on the back side.
- (m) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.
- (n) Pins of I/F connector shall not be touched directly with bare hands.

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2. STORAGE

- (a) Do not leave the module in high temperature, and high humidity for a long time.
It is highly recommended to store the module with temperature from 0 to 35 °C and relative humidity of less than 70%.
- (b) Do not store the TFT-LCD module in direct sunlight.
- (c) The module shall be stored in a dark place. It is prohibited to apply sunlight or fluorescent light during the store.

3. OPERATION

- (a) Do not connect,disconnect the module in the " Power On" condition.
- (b) Power supply should always be turned on/off by following item 6.3
" Power on/off sequence ".
- (c) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.
- (d) The cable between the back-light connector and its inverter power supply shall be a minimized length and be connected directly . The longer cable between the back-light and the inverter may cause lower luminance of lamp(CCFT) and may require higher startup voltage (Vs).
- (e) The standard limited warranty is only applicable when the module is used for general notebook applications. If used for purposes other than as specified, SEC is not to be held reliable for the defective operations. It is strongly recommended to contact SEC to find out fitness for a particular purpose.

4. OTHERS

- (a) Ultra-violet ray filter is necessary for outdoor operation.
- (b) Avoid condensation of water. It may result in improper operation or disconnection of electrode.
- (c) Do not exceed the absolute maximum rating value. (the supply voltage variation, input voltage variation, variation in part contents and environmental temperature, so on)
Otherwise the module may be damaged.
- (d) If the module displays the same pattern continuously for a long period of time,it can be the situation when the image "sticks" to the screen.
- (e) This module has its circuitry PCB's on the rear side and should be handled carefully in order not to be stressed.

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11. EDID

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| Address (HEX) | FUNCTION | Value HEX | BIN | DEC | ASCII or Data | Notes |
|------------------|------------------------|--------------|----------|-----|---------------------|----------------------------|
| 00 | Header | 00 | 00000000 | 0 | | EDID Header |
| 01 | | FF | 11111111 | 255 | | |
| 02 | | FF | 11111111 | 255 | | |
| 03 | | FF | 11111111 | 255 | | |
| 04 | | FF | 11111111 | 255 | | |
| 05 | | FF | 11111111 | 255 | | |
| 06 | | FF | 11111111 | 255 | | |
| 07 | | 00 | 00000000 | 0 | | |
| 08 | ID Manufacturer Name | 4C | 01001100 | 76 | S | 3 character ID |
| | | | | | E | |
| 09 | | A3 | 10100011 | 163 | C | "SEC" |
| 0A | ID Product Code | 50 | 01010000 | 80 | [P] | |
| 0B | | 30 | 00110000 | 48 | [0] | |
| 0C | 32-bit serial no. | 00 | 00000000 | 0 | | |
| 0D | | 00 | 00000000 | 0 | | |
| 0E | | 00 | 00000000 | 0 | | |
| 0F | | 00 | 00000000 | 0 | | |
| 10 | Week of manufacture | 00 | 00000000 | 0 | | |
| 11 | Year of manufacture | 13 | 00010011 | 19 | 2009 | 2009 |
| 12 | EDID Structure Ver. | 01 | 00000001 | 1 | 1 | EDID Ver. 1.0 |
| 13 | EDID revision # | 03 | 00000011 | 3 | 0 | EDID Rev. 0 |
| 14 | Video input definition | 80 | 10000000 | 128 | | |
| 15 | Max H image size | 20 | 00100000 | 32 | 32 | 32 cm(approx) |
| 16 | Max V image size | 13 | 00010011 | 19 | 19 | 19 cm(approx) |
| 17 | Display Gamma | 78 | 01111000 | 120 | 2.2 | Gamma 2.2 |
| 18 | Feature support | 0A | 00001010 | 10 | | |
| 19 | Red/green low bits | 09 | 00001001 | 9 | | 00001001 |
| 1A | Blue/white low bits | E5 | 11100101 | 229 | | 11100101 |
| 1B | Red x/ high bits | 97 | 10010111 | 151 | 0.590 | Red x 0.590= 10010111 |
| 1C | Red y | 57 | 01010111 | 87 | 0.340 | Red y 0.340= 01010111 |
| 1D | Green x | 54 | 01010100 | 84 | 0.330 | Green x 0.330= 01010100 |
| 1E | Green y | 8A | 10001010 | 138 | 0.540 | Green y 0.540= 10001010 |
| 1F | Blue x | 27 | 00100111 | 39 | 0.155 | Blue x 0.155= 00100111 |
| 20 | Blue y | 22 | 00100010 | 34 | 0.135 | Blue y 0.135= 00100010 |
| 21 | White x | 50 | 01010000 | 80 | 0.313 | White x 0.313= 01010000 |
| 22 | White y | 54 | 01010100 | 84 | 0.329 | White y 0.329= 01010100 |
| 23 | Established timing 1 | 00 | 00000000 | 0 | | |
| 24 | Established timing 2 | 00 | 00000000 | 0 | | |
| 25 | Established timing 3 | 00 | 00000000 | 0 | | |

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| | | | | | | |
|----|---------------------------------------|----|----------|-----|--------|---|
| 26 | Standard timing #1 | 01 | 00000001 | 1 | | not used |
| 27 | | 01 | 00000001 | 1 | | |
| 28 | Standard timing #2 | 01 | 00000001 | 1 | | not used |
| 29 | | 01 | 00000001 | 1 | | |
| 2A | Standard timing #3 | 01 | 00000001 | 1 | | not used |
| 2B | | 01 | 00000001 | 1 | | |
| 2C | Standard timing #4 | 01 | 00000001 | 1 | | not used |
| 2D | | 01 | 00000001 | 1 | | |
| 2E | Standard timing #5 | 01 | 00000001 | 1 | | not used |
| 2F | | 01 | 00000001 | 1 | | |
| 30 | Standard timing #6 | 01 | 00000001 | 1 | | not used |
| 31 | | 01 | 00000001 | 1 | | |
| 32 | Standard timing #7 | 01 | 00000001 | 1 | | not used |
| 33 | | 01 | 00000001 | 1 | | |
| 34 | Standard timing #8 | 01 | 00000001 | 1 | | not used |
| 35 | | 01 | 00000001 | 1 | | |
| 36 | Detailed timing/monitor descriptor #1 | 41 | 01000001 | 65 | 72.33 | Main clock= 72.33 MHz |
| 37 | | 1C | 00011100 | 28 | | |
| 38 | | 56 | 01010110 | 86 | 1366 | Hor active=1366 pixels |
| 39 | | A0 | 10100000 | 160 | 160 | Hor blanking=160 pixels |
| 3A | | 50 | 01010000 | 80 | | 4bit : 4bit |
| 3B | | 00 | 00000000 | 0 | 768 | Vertical active=768 lines |
| 3C | | 16 | 00010110 | 22 | 22 | Vertical blanking=22 lines |
| 3D | | 30 | 00110000 | 48 | | 4bit : 4bit |
| 3E | | 30 | 00110000 | 48 | 48 | |
| 3F | | 20 | 00100000 | 32 | 32 | H sync. Width=32 pixels |
| 40 | | 25 | 00100101 | 37 | 2 5 | V sync. Offset=2 lines V sync. Width=5 lines |
| 41 | | 00 | 00000000 | 0 | | 2bit : 2bit : 2bit : 2bit |
| 42 | | 35 | 00110101 | 53 | 309 | H image size= 353 mm(approx) |
| 43 | | AE | 10101110 | 174 | 174 | V image size = 198 mm(approx) |
| 44 | | 10 | 00010000 | 16 | | |
| 45 | | 00 | 00000000 | 0 | | No Horizontal Border |
| 46 | | 00 | 00000000 | 0 | | No Vertical Border |
| 47 | | 19 | 00011001 | 25 | | |
| 48 | Detailed timing/monitor descriptor #2 | 00 | 00000000 | 0 | | Manufacturer Specified (Timing) |
| 49 | | 00 | 00000000 | 0 | | |
| 4A | | 00 | 00000000 | 0 | | |
| 4B | | 0F | 00001111 | 15 | | |
| 4C | | 00 | 00000000 | 0 | | |
| 4D | | 00 | 00000000 | 0 | | Value=HSPWmin / 2 |
| 4E | | 00 | 00000000 | 0 | | Value=HSPWmax / 2 |
| 4F | | 00 | 00000000 | 0 | | Value=Thbpmin / 2 |
| 50 | | 00 | 00000000 | 0 | | Value=Thbpmax / 2 |
| 51 | | 00 | 00000000 | 0 | | Value=VSPWmin / 2 |
| 52 | | 00 | 00000000 | 0 | | Value=VSPWmax / 2 |
| 53 | | 00 | 00000000 | 0 | | Value=TVbpmin / 2 |
| 54 | | 00 | 00000000 | 0 | | Value=TVbpmax / 2 |
| 55 | | 1E | 00011110 | 30 | | Thpmin= value*2 + HA pixelClks |
| 56 | | B4 | 10110100 | 180 | | Thpmax= value*2 + HA pixelClks |
| 57 | | 02 | 00000010 | 2 | | Tvpmin= value*2 + VA lines |
| 58 | | 74 | 01110100 | 116 | | Tvpmax= value*2 + VA lines |
| 59 | | 00 | 00000000 | 0 | | Module revision |

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|----|---------------------------------------|----|----------|-----|-----|--------------------------|
| 5A | Detailed timing/monitor descriptor #3 | 00 | 00000000 | 0 | | ASCII Data String Tag |
| 5B | | 00 | 00000000 | 0 | | |
| 5C | | 00 | 00000000 | 0 | | |
| 5D | | FE | 11111110 | 254 | | |
| 5E | | 00 | 00000000 | 0 | | |
| 5F | | 53 | 01010011 | 83 | [S] | |
| 60 | | 41 | 01000001 | 65 | [A] | |
| 61 | | 4D | 01001101 | 77 | [M] | |
| 62 | | 53 | 01010011 | 83 | [S] | |
| 63 | | 55 | 01010101 | 85 | [U] | |
| 64 | | 4E | 01001110 | 78 | [N] | |
| 65 | | 47 | 01000111 | 71 | [G] | |
| 66 | | 0A | 00001010 | 10 | [^] | |
| 67 | | 20 | 00100000 | 32 | [] | |
| 68 | | 20 | 00100000 | 32 | [] | |
| 69 | | 20 | 00100000 | 32 | [] | |
| 6A | | 20 | 00100000 | 32 | [] | |
| 6B | | 20 | 00100000 | 32 | [] | |
| 6C | Detailed timing/monitor descriptor #4 | 00 | 00000000 | 0 | | Monitor Name Tag (ASCII) |
| 6D | | 00 | 00000000 | 0 | | |
| 6E | | 00 | 00000000 | 0 | | |
| 6F | | FE | 11111110 | 254 | | |
| 70 | | 00 | 00000000 | 0 | | |
| 71 | | 31 | 00110001 | 49 | [1] | |
| 72 | | 34 | 00110100 | 52 | [4] | |
| 73 | | 30 | 00110000 | 48 | [0] | |
| 74 | | 41 | 01000001 | 65 | [A] | |
| 75 | | 54 | 01010100 | 84 | [T] | |
| 76 | | 30 | 00110000 | 48 | [0] | |
| 77 | | 31 | 00110001 | 49 | [1] | |
| 78 | | 2D | 00101101 | 45 | [=] | |
| 79 | | 47 | 01000111 | 71 | [G] | |
| 7A | | 30 | 00110000 | 48 | [0] | |
| 7B | | 33 | 00110011 | 51 | [3] | |
| 7C | | 0A | 00001010 | 10 | [^] | |
| 7D | | 20 | 00100000 | 32 | [] | |
| 7E | Extension Flag | 00 | 00000000 | 0 | | |
| 7F | Checksum | 83 | 10000011 | 131 | | |

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